

WHAT IS CLAIMED IS:

1. An optical switch comprising: an electromagnetic driving mechanism that includes a U-shaped magnetic core having an intermediate part between two leg parts, a coil wound on the U-shaped magnetic core, a soft magnetic armature having two end portions that can face each other on the two leg parts and supported in such a manner that the armature can make an oscillating motion, and a permanent magnet arranged to apply a magnetic flux to the U-shaped magnetic core and the armature; at least one optical path switching unit directly fixed on the armature; at least one incidence-side optical fiber for making light incident on the optical path switching unit; and at least one emission-side optical fiber where the light with its optical path switched by the optical path switching unit is coupled.
2. The optical switch as claimed in claim 1, further comprising an incidence-side optical system for guiding the light from the incidence-side optical fiber to the optical path switching unit, and an emission-side optical system for guiding the light with its optical path switched by the optical path switching unit to the emission-side optical fiber.
3. The optical switch as claimed in claim 1, wherein the oscillating motion of the armature is a reciprocating turning motion about a portion near a central portion of the armature as a fulcrum, and the turning motion is generated by switching a magnetically attracting force that acts between one of the leg parts of the U-shaped magnetic core and one of the end portions of the armature that faces the leg part, and a magnetically attracting force that acts between the other leg part of the U-shaped magnetic core and the other end portion of the armature that faces the leg part.
4. The optical switch as claimed in claim 1, wherein the optical path switching unit includes a first mirror, and the first mirror is installed on the

armature and in such a manner that it has a light reflecting direction within a plane substantially parallel to the oscillating direction of the armature.

5. The optical switch as claimed in claim 1, wherein the optical path switching unit includes a second mirror having at least one reflection surface, and the second mirror is installed on the armature and in such a manner that it has a light reflecting direction within a plane substantially perpendicular to the oscillating direction of the armature.

6. The optical switch as claimed in claim 1, wherein the optical switching unit is a plate member fixed on the armature and adapted for intercepting light from the incidence-side optical fiber.

7. The optical switch as claimed in claim 1, wherein the optical path switching unit includes a transparent member, and the transparent member has a plane of light incidence and a plane of light emission that are substantially parallel to each other and substantially parallel to the oscillating direction of the armature.

8. The optical switch as claimed in claim 1, wherein the optical path switching unit includes a transparent member, and the transparent member has a plane of light incidence and a plane of light emission that are not parallel to each other and substantially parallel to the oscillating direction of the armature.

9. The optical switch as claimed in claim 1, wherein the optical path switching unit includes a transparent member, and the transparent member has two sets of planes of light incidence and planes of light emission that are substantially parallel to each other and substantially parallel to the oscillating direction of the armature.

10. The optical switch as claimed in any one of claims 7 to 9, wherein the transparent member has a rectangular flat shape.

11. The optical switch as claimed in claim 1, wherein the optical path switching unit is provided near one of the end portions of the armature that

faces one of the leg parts of the U-shaped magnetic core.

12. The optical switch as claimed in claim 1, wherein the optical path switching unit is provided near the two end portions of the armature that face the two leg parts, respectively.

13. The optical switch as claimed in claim 1, wherein at least one of the incidence-side optical fiber and the emission-side optical fiber is provided in plural numbers.

14. The optical switch as claimed in claim 1, wherein the permanent magnet is arranged between the U-shaped magnetic core and the armature, and one magnetic pole end of the permanent magnet is situated near the center of the intermediate part of the U-shaped magnetic core while the other magnetic pole end of the permanent magnet is situated near the fulcrum of the oscillating motion of the armature.

15. The optical switch as claimed in claim 1, wherein the permanent magnet is a composite permanent magnet having one magnetic pole on its both ends and the other magnetic pole at its central portion and is provided between the two leg parts of the U-shaped magnetic core.

16. The optical switch as claimed in claim 1, wherein the permanent magnet is fixed to the armature in such a manner that its one magnetic pole comes into contact with the armature, and is caused to swing or oscillate together with the armature.

17. The optical switch as claimed in claim 1, wherein the electromagnetic driving mechanism further includes a fixed-side insulator base for integrally holding the U-shaped magnetic core and the permanent magnet and a moving-side insulator for holding the armature, and the U-shaped magnetic core and the permanent magnet are fixed by integral molding of the fixed-side insulator base, with the permanent magnet held in contact with a part of the U-shaped magnetic core.

18. The optical switch as claimed in claim 1, wherein the electromagnetic driving mechanism further includes a hinge spring part for supporting the armature while applying an energizing force or a damping force to the oscillating motion of the armature, and a moving spring part interlocked with the oscillating motion of the armature.